REMARKS

This Amendment and Response is made in reply to the Office Action dated April 4, 2008, in which the following rejections were made:

Claims 1-11 were rejected under 35 USC §101 as claiming non-statutory subject matter;

Claims 1-9 were rejected under 35 USC § 103(a) as obvious over Stoecker in view of Cengel;

Claims 10 and 12-17 were rejected under 35 USC § 103(a) as obvious over Stoecker and Cengel, further in view of Seem; and

Claim 11 was rejected under 35 USC § 103(a) as obvious over Stoecker, Cengel, and Seem, further in view of Parlos.

Applicants respectfully traverse these rejections below. Claims 1-17 previously were pending. By the present Amendment, claim 18 is added. Claims 1-18 are pending for consideration.

Claims 1-11 were rejected under 35 USC §101 as claiming non-statutory subject matter.

According to the §101 examination guidelines of MPEP § 2107, Applicants first note that claims 1-11 fall within an enumerated statutory category; namely, they are directed to a process.

Second, claims 1-11 do not recite a law of nature, a natural phenomenon, or an abstract idea. Rather, claims 1-11 recite a process that *applies* laws of nature to *measure* natural phenomena in order to obtain a *useful*, *concrete*, and *tangible* result. Specifically, claims 1-11 relate to a process for detecting flash gas in a

refrigeration system by way of measuring variations in the rates of heat flow of heat exchanger fluid flow across a heat exchanger of a system and heat flow of refrigerant fluid flow across a heat exchanger in order to establish an energy balance that provides for the monitoring of refrigerant flow and identifies the presence of flash gas. This process is not a mere abstract idea. Rather, claims 1-11 recite variations on a concrete process for deriving a tangible parameter that is useful for detecting flash gas in a vapour-compression refrigeration or heat pump system.

Since Applicants' claimed subject matter falls within an enumerated statutory category and, considered as a whole, does not fall within a judicial exception to the enumerated statutory categories, Applicants respectfully submit that the rejection of claims 1-11 under 35 USC §101 should be withdrawn, and that claims 1-11 should be passed to issue.

Claims 1-9 were rejected under 35 USC § 103(a) as obvious over Stoecker in view of Cengel. A *prima facie* case of obviousness under 35 USC §103(a) is established if the teachings from the prior art itself appear to suggest the claimed subject matter "as a whole" to a person of ordinary skill in the art. Claim 1 recites a method for detecting flash gas in a vapour-compression refrigeration or heat pump system comprising a compressor, a condenser, an expansion device, and an evaporator interconnected by conduits providing a flow path for a refrigerant, wherein determining a first rate of heat flow of a heat exchange fluid flow across a heat exchanger of the system and a second rate of heat flow of the refrigerant across the heat exchanger, and using the rates of heat flow for

establishing an energy balance from which a parameter for monitoring the refrigerant flow is derived.

Stoecker does not teach or even remotely suggest the recitations of claim 1. First, Stoecker's purpose is not to detect flash gas, as recited by claim 1, but to remove flash gas. Stoecker determines a quantity of *removed* flash gas, but only after the flash gas has been removed.

Second, Stoecker fails to teach or suggest determining a first rate of heat flow of a heat exchange fluid flow across a *heat exchanger* of the system and a second rate of heat flow of the refrigerant across the heat exchanger. Third, Stoecker also fails to teach or suggest establishing an energy balance *from which a parameter is derived*. Fourth, Stoecker fails to teach or suggest a parameter *for monitoring* the refrigerant *flow*. Rather, Stoecker discloses, at most, forming an energy balance across a *flash gas separator* to determine *the quantity of flash gas removed* by the separator. Stoecker in no way teaches or suggests that the quantity of flash gas can be used to monitor a flow of refrigerant.

Thus, Stoecker entirely fails to teach or suggest the recitations of claim 1.

Although Cengel discloses an energy balance across a heat exchanger in a refrigeration plant, Cengel fails to teach or suggest establishing an energy balance *from which a parameter is derived*. Further, Cengel fails to teach or suggest a parameter *for monitoring* the refrigerant *flow*. Moreover, Cengel fails to teach or suggest anything regarding flash gas in a refrigeration plant. Thus, Cengel fails to supply the deficiencies of Stoecker with reference to claim 1.

The combination of Stoecker and Cengel also fails to teach or suggest a method for detecting flash gas *in a refrigeration system* by establishing an energy balance *from which a parameter for monitoring refrigerant flow is derived*.

Accordingly, Applicants respectfully submit that the rejection of claim 1, as being obvious over Stoecker in view of Cengel, is improper.

Claims 2-9 depend from claim 1 and include additional recitations thereto. Since the cited references do not teach or suggest what claim 1 recites, Applicants respectfully submit that the rejection of claims 2-9, as being obvious over Stoecker in view of Cengel, is improper for at least the reasons stated with reference to claim 1.

Accordingly, Applicants respectfully submit that the rejection of claims 1-9 under 35 USC §103(a) should be withdrawn.

Claims 10 and 12-17 were rejected under 35 USC § 103(a) as obvious over Stoecker and Cengel, further in view of Seem. Claim 10 depends from claim 1 and further recites establishing a residual as difference between the first rate of heat flow and the second rate of heat flow. Examiner is correct to concede that neither Stoecker nor Cengel, individually, nor the combination thereof, teaches or suggests "establishing a residual and generating a signal", but is mistaken to assert that Stoecker in view of Cengel "teach most of the limitations of the claim." Stoecker or Cengel, individually, or the combination thereof, not only does not teach or suggest the recitations of claim 1 (as discussed above), but additionally fails to teach or suggest at least establishing a residual as a difference between two rates of heat flow, as recited by claim 10.

Seem fails to supply the deficiencies of Stoecker and Cengel. First, Seem fails to teach or suggest a method for detecting flash gas in a refrigeration system. Rather, Seem teaches, at most, a method for detecting faults in an air-handling system. Second, Seem fails to teach or suggest determining a first rate of heat

flow of *a heat exchange fluid* and a second rate of heat flow of *a refrigerant* across a simple *heat exchanger*. Rather, Seem teaches, at most, monitoring temperatures of a *single, mixed* fluid across an entire *air-handling system* including mixing damper valves, a heating coil, and a fan. Third, Seem fails to teach or suggest a parameter for monitoring *refrigerant* flow. Thus, Seem fails to supply the deficiencies of Stoecker and Cengel with regard to claim 1.

The combination of Stoecker, Cengel, and Seem also fails to teach or suggest what is recited by claim 1. Thus, the rejection of dependent claim 10 as being obvious over Seem in combination with Stoecker and Cengel cannot stand. Applicants respectfully submit that the rejection of claim 10 under 35 USC §103(a) should be withdrawn.

Claim 12 recites a flash gas detection device for a vapour-compression refrigeration or heat pump system comprising a compressor, a condenser, an expansion device, and an evaporator interconnected by conduits providing a flow path for a refrigerant, wherein the device comprises means for determining a first rate of heat flow of a heat exchange fluid flow across a heat exchanger of the system and a second rate of heat flow of the refrigerant across the heat exchanger, and using the rates of heat flow for establishing an energy balance from which a parameter for monitoring the refrigerant flow is derived, and means for evaluating the refrigerant mass flow, and generate an output signal. Claims 13-17 depend from claim 12 and include additional recitations thereto.

Examiner's attention is respectfully directed to the above discussion of Stoecker, Cengel, and Seem with reference to claims 1 and 10. Regarding claim 12,the combination of Stoecker and Cengel fails to teach or even remotely suggest a *flash gas detection device*. Specifically, the combination of Stoecker and Cengel

fails to teach or suggest *means* for determining a first rate of heat flow of a heat exchange fluid flow across a heat exchanger of the system and a second rate of heat flow of the refrigerant across the heat exchanger. The combination of Stoecker and Cengel also does not teach or suggest using the rates of heat flow to establish an energy balance, *deriving* a parameter from the energy balance, monitoring the refrigerant flow based on the parameter, evaluating the refrigerant mass flow, or generating an output signal.

In response to Examiner's comments at page 10 of the present Office Action, the following statements are made in order to point out with specificity the ways in which Seem fails to teach the recitations of claim 12.

Seem discloses monitoring air temperatures and the controller output of a finite state machine in order to detect faults. However, Seem teaches away from the present invention by stating that there is *no predictable relationship* by which to calculate any particular *process variable* based on the controller output. (column 5, lines 21-31). Thus, *Seem teaches that it is not possible* to use the methods of Seem in order *to derive a parameter for monitoring refrigerant flow*, as recited by claim 12.

Additionally, Seem fails to teach or suggest determining a first rate of heat flow of *a heat exchange fluid* and a second rate of heat flow of *a refrigerant* across a simple *heat exchanger*. Rather, Seem teaches, at most, monitoring temperatures of a *single, mixed* fluid across an entire *air-handling system* including mixing damper valves, a heating coil, and a fan.

For at least the stated reasons, the combination of Stoecker, Cengel, and Seem fails to teach or suggest what is recited by claim 12. Since the cited references do not teach or suggest what claim 12 recites, the rejection of claim 12

as being obvious over Stoecker in view of Cengel, in further view of Seem, cannot stand.

Because claims 13-17 depend from claim 12 and include additional recitations thereto, the rejection of claims 13-17 as being obvious over the combination of Stoecker, Cengel, and Seem cannot stand for at least the reasons stated with reference to claim 12.

Accordingly, Applicants respectfully submit that the rejection of claims 12-17 under 35 USC §103(a) should be withdrawn.

Claim 11 was rejected under 35 USC § 103(a) as obvious over Stoecker, Cengel, and Seem, further in view of Parlos. Claim 11 depends from claim 10, and further recites providing a fault indicator by means of the residual, the fault indicator being provided according to the formula:

$$S_{\mu_1,i} = \begin{cases} S_{\mu_1,i-1} + s_i, \ when \ S_{\mu_1,i-1} + s_{\mu_1,i} > 0 \\ 0, \ when \ S_{\mu_1,i-1} + s_{\mu_1,i} \le 0 \end{cases}$$

where $s_{\mu_1,i}$ is calculated according to the following equation:

$$s_{\mu_1,i} = -k_1\left(r_i - \frac{\mu_0 + \mu_1}{2}\right)$$

where

i: index of timewise sensing point;

ri: residual;

k1: proportionality constant;

μ0: first sensibility value; and

μ1: second sensibility value.

Parlos relates to a method and system for early detection of incipient faults in electric motors. Appropriately, Examiner does not argue that Parlos supplies any of the above-identified deficiencies of Stoecker, Cengel, and Seem. Rather, Examiner asserts merely that one having ordinary skill in the art would find it obvious to use a formula as a fault indicator, and cites Parlos as an *example* of a formula.

Applicants respectfully submit that, while Parlos may disclose *a* formula used to detect an incipient fault *in an electric motor*, Parlos fails to teach or suggest a method for detecting flash gas in a refrigeration system, as recited by claim 1. Additionally, Parlos fails to teach or suggest *the* formula recited by claim 11. Further, Parlos fails to teach or suggest determining a first rate of heat flow of a heat exchange fluid flow across a heat exchanger of the system and a second rate of heat flow of the refrigerant across the heat exchanger. Indeed, Parlos is entirely silent regarding *heat exchange fluid* or *refrigerant*. Yet further, Parlos fails to teach or suggest establishing an energy balance *from which a parameter is derived*. Moreover, Parlos fails to teach or suggest a parameter *for monitoring refrigerant flow*. For at least these reasons, Parlos entirely fails to supply the deficiencies of Stocker, Cengel, and Seem with reference to claim 1. Thus, Examiner fails to state a *prima facie* case of obviousness with reference to the recitations of claim 11.

Accordingly, Applicants respectfully submit that the rejection of claim 11 under 35 USC §103(a) is improper, and should be withdrawn.

As Applicants have traversed each and every rejection raised by the Examiner, hereby it is respectfully requested that Examiner withdraw the

rejections of claims 1-17. With reference to newly added claim 18, Applicants respectfully submit that claim 18 finds support at least in claim 1 and at page 18, lines 4-14 of the present specification. Accordingly, Applicants respectfully request that Examiner pass claims 1-18 to issue.

Applicants believe that no fees are due in connection with this Amendment and Response. If such additional fees are deemed necessary, Attorneys for Applicants hereby authorize the Commissioner to deduct such fees from our Deposit Account 13-0235.

Respectfully submitted,

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